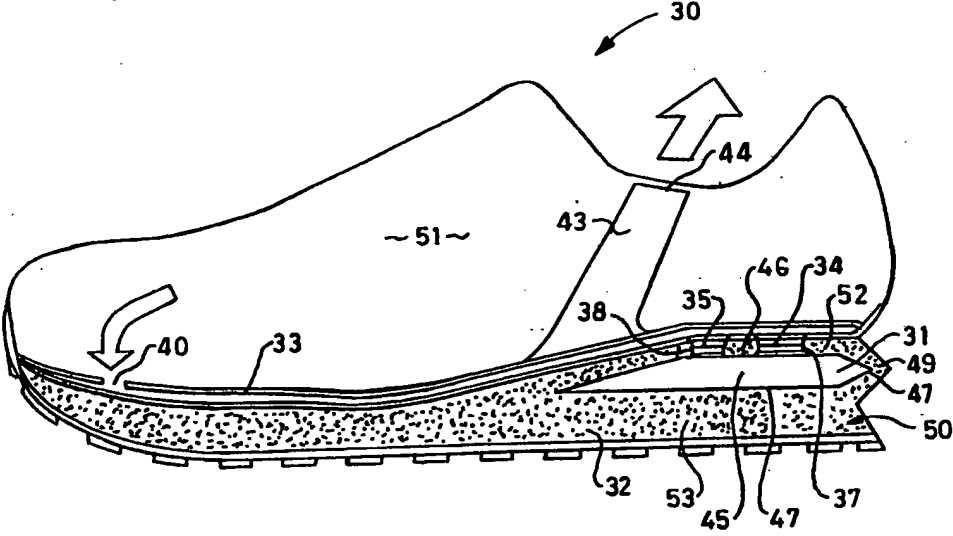




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/AU92/00554 (22) International Filing Date: 16 October 1992 (16.10.92) (30) Priority data: PK 8997 18 October 1991 (18.10.91) AU (71)(72) Applicant and Inventor: O'DWYER, James, Michael [AU/AU]; 1256 Ross River Road, Kelso Townsville, QLD 4815 (AU). (74) Agent: PIZZHEY, John, Kingston; Pizzhey & Company, Le- vel 6, Trustee House, 444 Queen Street, Brisbane, QLD 4000 (AU). (81) Designated States: AT, AU, BB, BG, BR, CA, CH, CS, DE, DK, ES, FI, GB, HU, JP, KP, KR, LK, LU, MG, MN, MW, NL, NO, PL, RO, RU, SD, SE, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, SN, TD, TG).</p>		<p>Published With international search report.</p>
<p>(54) Title: IMPROVEMENTS TO FOOTWEAR</p>  <p>(57) Abstract</p> <p>Footwear ventilation means is provided including a pumping chamber (31), and preferably arranged in the heel region (50) of the footwear, whereby operative cyclic supporting loads applied to the footwear will compress the pumping chamber and cause the pumping chamber (31) to contract and pump air under the user's heel pressure and thereby ventilate the footwear. The air may be pumped from the footwear to induce air circulation in the footwear or it may pump air into the footwear for forced air draught ventilation. Induced air draught is preferred for cooling the footwear and forced air draught is preferred for heating the footwear. The outlet (35) from the pumping chamber (31) may be regulated to provide a shock absorbing action which may constitute the or a primary consideration of the pumping chamber configuration.</p>		

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"IMPROVEMENTS TO FOOTWEAR"

-- BACKGROUND OF THE INVENTION --

This invention relates to improvements to footwear.

This invention has particular application to sporting
5 footwear such as sneakers and joggers and hereinafter generally
referred to as sneakers but of course it is not limited thereto
and can be used in boots, shoes and slippers and the like.
However for illustrative purposes only, particular reference
will be made hereinafter to its application to sneakers.
10 In recent years the construction of sneakers has become
very complex with a view to making sneakers comfortable to wear
and able to minimise shock loadings placed on the body during
active use. In order to achieve the desired results many
sophisticated construction techniques and synthetic materials
15 have been utilised in their manufacture. However despite the
sophisticated nature of such footwear there remains room for
improvement both in relation to discomfort resulting from shock
loadings applied to the user's feet or in relation to
discomfort resulting from the user's feet being either
20 uncomfortably hot or cold or confined without effective
ventilation..

Furthermore a common problem remains with sneakers and
other footwear, namely foot odour resulting from uncomfortably
hot conditions. This problem is particularly noticeable in
25 sneakers due to the interaction of foot perspiration with the
synthetic materials of the sneakers. This condition is
aggravated by the lack of air circulation about the foot and
may cause fungal growth and other adverse medical problems for
the users.

30 Footwear is also used for activities on cold surfaces and
by persons with poor circulation to their extremities including
their feet. At present the most common remedy for such
conditions is to wear thick socks as insulation against ingress
of the cold. This is only partially effective and may cause
35 discomfort to the user.

-- SUMMARY OF THE INVENTION --

The present invention aims to alleviate at least one of the
abovementioned disadvantages and to provide improvements to

footwear which will be effective in use.

With the foregoing in view, this invention in one aspect resides broadly in ventilation means for ventilating a footwear, including pump means arranged in reactive relationship with the footwear such that in use loading placed upon the footwear will cause the pump means to ventilate the footwear. The ventilation may be effected by pumping air to, from or within the footwear. The pump assembly may be of basic form and be constituted by a pumping chamber biased to an expanded position to induce air therein which is expelled upon compression of the pumping chamber. Alternatively the pump assembly may be in the form of a pumping chamber incorporating valving for selectively pumping air within the footwear. The ventilation means may be adapted to induce a cooling effect or a warming effect to the footwear.

The pump assembly may include a pumping chamber having separate air inlet and air outlet means provided with non-return valves or the pumping chamber may be provided with openings within the footwear through which air is admitted and expelled to and from the pumping chamber as a result of foot action relative to those openings within the footwear.

Preferably the pumping chamber is biased to an expanded position such that after compression it will automatically expand to induce air into the pumping chamber. The biasing means may be an internal coil spring or the like or it constituted by the material and form of the pumping chamber. If desired, the pumping chamber could be adapted to be positively expanded by a linkage or line means operated by longitudinal deformation of the footwear sole during successive cycles of use. For example a tension member may extend between the toe of the sole and the heel such that flexing of the toe portion relative to the remainder of the sole draws the pumping chamber to an expanded attitude for subsequent compression by the weight of the user bearing upon the sole. Alternatively, a pump actuating member may depend from the footwear and be forced upwardly in a pumping action relative to the footwear upon movement of the footwear towards the ground.

In one embodiment of the invention the pumping chamber is

in the form of an insole assembly having air supply ducts extending along opposing sides thereof and communicating with an air pumping chamber disposed between the air supply ducts and non-return valves interconnecting the air supply ducts with the pumping chamber. Air may be expelled from or drawn into the pumping chamber and expelled upwardly through the outlets into the footwear. If desired only one air supply duct may be provided to act as an inlet or outlet and a complementary outlet/inlet may be arranged around the side of the insert to communicate with apertures in the sidewall of the shoe.

Preferably the or each air inlet has an elevated inlet opening so as to alleviate the pumping of moisture or water through the pumping chamber when the footwear is worn in wet conditions. The air outlets from the footwear could be placed in the lower portion or sole if desired. Suitably the or each air inlet is also provided with filter means adapted to exclude the passage of dirt and other foreign matter and reduce entry of water to the air supply means.

The ventilating means may be provided as an insert or it may be formed integrally with the footwear. Furthermore the outlets associated with the pumping chamber may be so formed as to permit restricted discharge of air therefrom such that the pumping chamber provides a selected degree of cushioning or shock absorption beneath the user's feet. If desired the air outlet may be progressively adjustable from fully open to fully closed and suitably by control means incorporated into the heel of the footwear.

In another aspect this invention resides broadly in footwear including ventilation means for ventilating the footwear, the ventilation means including a pump assembly arranged in reactive relationship with the footwear such that in use loading placed upon the footwear will actuate the pump causing air to be circulated through the footwear.

In yet another aspect this invention resides broadly in footwear having shock absorbing means including a fluid compression chamber arranged whereby operative supporting loads applied to the footwear will compress the compression chamber and compression chamber outlet regulation means for regulating

the rate of discharge of fluid from said compression chamber. The fluid may be air which is discharged to atmosphere or it may be a fluid which is discharged to a holding chamber from which fluid may be returned to the compression chamber.

- 5 Preferably the compression chamber is a heel compression chamber. The regulation means may be fixed or externally adjustable valve means and may be a in the form of a non-return valve assembly.

10 In a further aspect this invention resides broadly in a sole assembly including:-

- a sole part;
- a pumping chamber in the heel portion of the sole part;
- an insole part having air passages therein communicating
- 15 with an inlet to and an outlet from the pumping chamber, and
- respective non-return valves operatively interposed between
- the air passages and the inlet an the outlet.

-- BRIEF DESCRIPTION OF THE DRAWINGS --

20 In order that this invention may be more readily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate a typical embodiment of the invention and wherein:-

- FIG. 1 is an exploded perspective view of one form of ventilating means according to the present invention;
- FIG. 2 is a diagrammatic cross-sectional view taken along
- 25 the line 2-2 of FIG. 1;
- FIG. 3 is a diagrammatic cross-sectional view of another form of footwear incorporating ventilating means of the present invention;
- FIG. 4 is a diagrammatic cross-sectional view of a
- 30 preferred embodiment of the invention;
- FIG. 5 diagrammatically illustrates the air flow of the preferred embodiment illustrated in FIG. 4, and
- FIGS. 6 to 9 illustrate further embodiments of the invention.

35 -- DESCRIPTION OF THE PREFERRED EMBODIMENT --

The ventilating means 10 illustrated in Fig. 1 is in the form of an insole assembly 9 comprising an upper flow-through pad 11 and a lower pumping assembly 12. The pumping assembly

12 includes a compartmentalised pumping chamber 14 and peripheral air supply chamber 13 extending thereabout. The pumping chamber 14 is provided with a series of air outlets 15 on its upper surface, each of which is associated with a non-return valve such as the flap valves 16. Further non-return valves 17 are supported along the inner wall of the pumping chamber and form controlled inlets 18 through which the pumping chamber communicates with the air supply chamber 13.

The pumping assembly 12 is formed of a resilient plastics material which exhibits elastic recovery after each cycle of compression by foot pressure. The air supply chamber 13 is provided with a pair of air inlets 19 which communicate through snorkel like ducts 20 with filtered air inlets 21 adjacent the upper rear edge of the foot opening 22.

In use, when a user walks or runs a cycle of repeated operations may be commenced resultant from the user's weight upon the sole of the footwear cyclically compressing the pumping chamber 14 and causing air to drawn therein through the inlets 18 and be expelled through the non-return valves 16 for distribution to the interior of the footwear through the flow-through foot pad 11. The pumping chamber 14 expands elastically when the user's weight is removed from the footwear, thus causing air to be induced through the non-return valves 17 from the air supply chambers 13. After air inducement, the non-return valves 17 close the inlets 18 such that on commencement of the next cycle of operations air is once again expelled into the interior of the footwear through the outlets 15.

The chamber 13 communicates with the filtered air inlets 21 for air supply from a position elevated above the ground. This is to enable the footwear to be used in damp conditions or in shallow puddles without ingesting water into the pumping chamber.

FIG. 4 illustrates the presently preferred embodiment of the invention adapted for inducing a cooling air flow through the footwear 30. For this purpose footwear is constructed with an integral pumping chamber 31 moulded into the heel section of the sole assembly 32 and adapted to co-operate with a ducted

insole 33 through respective inlet and outlet non-return valves 34 and 35. The ducted insole 33 is diagrammatically illustrated in FIG. 5. It is formed as a non-compressible insert having an air inlet 40 beneath the toe region of the shoe, an inlet passage 41 communicating with the non-return inlet valve 34 and an air outlet passage 42 communicating with the non-return exhaust valve 35 and with a flat exhaust tube 43 adapted to extend upwardly along the inside arch of the footwear for exhausting air upwardly through its outlet 44 and away from a user's foot. The outlet 44 may include a filter.

The inside arch portion of the footwear is chosen as there is little pressure on the side of the footwear at this region and thus placement of the exhaust tube 43 at this position should not reduce comfort for a user. Furthermore it will be seen that the passage length between the non-return valves 34 and 35 and the outlet 44 is relatively long. This is provided to damp out and thus reduce the effect the noise emitted from operation of the non-return valves 34 and 35.

It is preferred that the non-return valves 34 and 35 are fixed to the ducted insole 33 such that when it is removed from the footwear the valves 34 and 35 release from their press-seal fit into the inlet aperture 37 and the outlet aperture 38 in the sole assembly 32 for communication with the pumping chamber 31. This allows for easy servicing or replacement of the non-return valves 34/35 as required. Furthermore the insert together with the valves 34/35 may be removed to enable the footwear to be washed and any water drained from the pumping chamber 31 by inverting the footwear.

The pumping chamber 31 is located in the heel portion 50 because of the available thickness of the sole assembly 32 in this area and because of the high pressure that is applied to this part of the sole assembly 32 in use, upon contact with the ground.

The compression chamber includes a central portion 45 having substantially parallel upper and lower walls 46 and 47 and converging upper and lower peripheral walls as illustrated, so as to maintain operative lateral stability of the sole while allowing for substantially parallel movement between the top

and bottom walls 46 and 47 between the expanded and compressed attitudes. The converging upper and lower peripheral walls are formed such that the front of the air chamber 31 is of a deep wedge shape whereas the back and side converging walls of the
5 air chamber 31 are of a shallow wedge form and are so formed that the outermost edge 48 maintains a constant distance from the outer face 49 of the sole to provide a substantially even thickness of material supporting the sole assembly 32 above the pumping chamber 31. The arrangement is such that when
10 compressed the volume of the pumping chamber 31 approaches zero and the line of the ducted insole straightens along the length of the footwear to substantially conform to the line of a standard sneaker.

In use, impact of the heel portion 50 of the sole assembly
15 32 will result in rapid compression of air in the pumping chamber 31 and exhaustion of air through the non-return valve 35 to be exhausted through the outlet via the exhaust tube 43. This rapid compression of air in the pumping chamber 31 will result in an increase in air temperature but the hot air being
20 exhausted away from the user. As weight is taken from the heel the compression chamber will expand as a result of the natural resilience of the materials forming the heel portion 50 of the sole assembly 32 and air will be induced through the inlet 40 beneath the user's toe through the flow passage 41 via the
25 inlet non-return valve 34. At the end of the induction cycle the non-return valve 34 will close and upon the next impact with the ground the air will again be compressed and exhausted through the outlet 44. In this manner, cool air will be induced into the footwear through the foot opening or if
30 desired through auxiliary openings in the upper portion thereof and cycled via the pumping chamber for exhaust upwardly and away from the footwear.

The uppers 51 may be formed so as to be able to expand and contract slightly in front of the foot opening. It is
35 considered that this will assist in the vertical pumping action of the upper heel 52 relative to the lower heel 53. The non-return valves 34/35 may be of a type in which the effective opening provided thereby may be adjustable or alternatively

they may be of the type which may be readily replaced to modify the valve operating characteristics, such as to suit a user's needs. Suitably a slide valve could be provided in the ducted insole at the base of the exhaust non-return valve. The slide valve could be utilised to vary the aperture through which air could be exhausted from the non-return valve into the ducted insole. Furthermore the inside surface of the uppers 51 may include ribs to form air flow paths to assist flow of air to the inlet 40 and past the areas of the foot to be ventilated.

10 In the embodiment illustrated in FIG. 6 the heel section 60 of the footwear 61 is hingedly attached to the sole assembly 62 by a transverse hinge 63. The heel section contains a recess 64 in its upper surface in which a compressible air bag is supported and co-operating with a complementary protrusion 65
15 formed in the underside of the sole assembly 62 above the recess 64. Suitable valving means are provided to duct air pumped by the compressible air bag upon cyclic intake and compression resulting from movement of complementary protrusion 65 into the recess 64 at each step and compression of the air
20 bag therein. The air bag may be biased to an expanded configuration, such as by the movement of the heel section 60 pivotally away from the sole section 62 when user's weight is removed from the footwear.

Alternatively as illustrated in FIG. 7 the footwear 70 may
25 include a pumping chamber 71 mounted externally at the rear thereof and including a vertically reciprocable plunger adapted to be forced upwardly into the chamber 71 to cause the required air pumping action. The plunger 72 extends downwardly from the underside of the footwear 70 such that it will be pushed
30 upwardly in a pumping action upon cyclic contact between the footwear and the ground.

An alternative arrangement is illustrated in FIG. 8 wherein distortion of the footwear in use is utilised to actuate the pumping means. In this embodiment it will be seen that an
35 externally mounted cylinder pump assembly 80 is supported between a fixed lower mounting 81 and a fixed upper mounting 82. When the footwear is distorted to a configuration as shown in dotted outline, as occurs just prior to lifting the foot

when walking or jogging, it will be seen that mounting 82 moves upwardly and forwardly relative to the mounting 81 with the result that the distance between the mountings 81 and 82 is cyclically compressed and extended resulting in a pumping
5 action by the cylindrical pump assembly 80.

The characteristics of the footwear which incorporates non-return inlet and outlet valves to a pumping chamber may be operatively varied by either maintaining either or both valves open or closed. Furthermore, the characteristics may be
10 varied by providing a separate and adjustable relief valve for the pumping chamber, by providing additional passages each able to interchangeably communicate with the pumping chamber and selectable to vary the operating characteristics, or by blocking either or both the inlet and outlet passages to the
15 pumping chamber.

In the embodiment illustrated in FIG. 9 the exhaust tube 90 of the ducted insole 91 is provided with a slide actuator 93 linked to a flap valve 94 by a flexible push/pull cable 95 whereby the flap valve 94 may be moved between a normal
20 position at which it closes an opening 96 interconnecting the inlet passage 97 to the outlet passage 98 and a blocking position at which it blocks flow through the inlet passage 97. When the flap valve is in the normal position the operation is as described with reference to FIG. 6. When the flap valve is
25 in the blocking position, the inlet passage 97 communicates with the outlet passage 98 and air is circulated through the exhaust tube 90.

As mentioned previously the pump assembly may be adapted to induce cooling air into the footwear by arranging the inlet
30 adjacent the toe area and by exhausting to atmosphere or it may be adapted to heat the footwear by exhausting internally of the footwear and taking its inlet from the exterior of the footwear. It will of course be realised that the above has been given only by way of illustrative example of the
35 invention and that all such modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the invention as is defined in the appended claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. Ventilation means for ventilating a footwear, including pump means arranged in reactive relationship with the footwear
5 whereby loading placed upon the footwear in use will cause said pump means to pump air to ventilate the footwear.

2. Ventilation means as claimed in claim 1, wherein said pump means includes a pump chamber arranged in reactive
10 relationship with a user's heel.

3. Ventilation means as claimed in claim 2, wherein said pump chamber is a chamber formed in the heel portion of the footwear and said pump means includes respective non-return
15 valve means interconnecting said pump chamber with an air inlet and an air outlet.

4. Ventilation means as claimed in claim 3, wherein said pump chamber is biased to an expanded position and
20 underlies the heel of the user whereby the pump chamber is compressed by heel pressure.

5. Ventilation means as claimed in claim 3 or claim 4, wherein said pump chamber is so formed as to maintain lateral
25 stability between the upper and lower portions of the heel assembly.

6. Ventilation means as claimed in any one of the preceding claims, wherein said pump means pumps air from the
30 footwear from an internal air inlet adjacent the toe support of the footwear.

7. Ventilation means as claimed in any one of the preceding claims, wherein said pump means exhausts air from the
35 footwear adjacent the inside arch of the footwear.

8. Ventilation means as claimed in claim 6 or claim 7 and including an insole assembly providing an air passage between

said pump means and said air inlet and/or said air outlet.

9. Ventilation means as claimed in claim 8, wherein said insole assembly includes respective non-return valves
5 communicating with said air inlet and said air outlet.

10. Ventilation means as claimed in any one of the preceding claims, wherein said pump means includes a restricted air outlet.

10 11. Footwear having shock absorbing means including a fluid compression chamber arranged whereby operative supporting loads applied to the footwear will compress said compression chamber and compression chamber outlet regulation means for regulating
15 the rate of discharge of fluid from said compression chamber.

12. Footwear as claimed in claim 11, wherein said compression chamber is a heel compression chamber and said regulation means is a non-return valve assembly.

20 13. Footwear including a pumping chamber arranged in the sole whereby cyclic supporting loads applied to the footwear actuates said pumping chamber and air ducting means for directing air to or from the footwear.

25 14. Footwear as claimed in claim 13, wherein said air ducting means includes an air inlet adjacent the toe region of the footwear and non-return valve means permitting air flow from said air inlet to said pumping chamber.

30 15. Footwear as claimed in claim 14, wherein said air ducting means and said non-return valve means are formed as a removable insole assembly.

35 16. A sole assembly including:-
a sole part;
a pumping chamber in the heel portion of said sole part;
an insole part having air passages therein communicating

12

with an inlet to and an outlet from said pumping chamber, and respective non-return valves operatively interposed between said air passages and said inlet and said outlet.

5

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FIG. 1

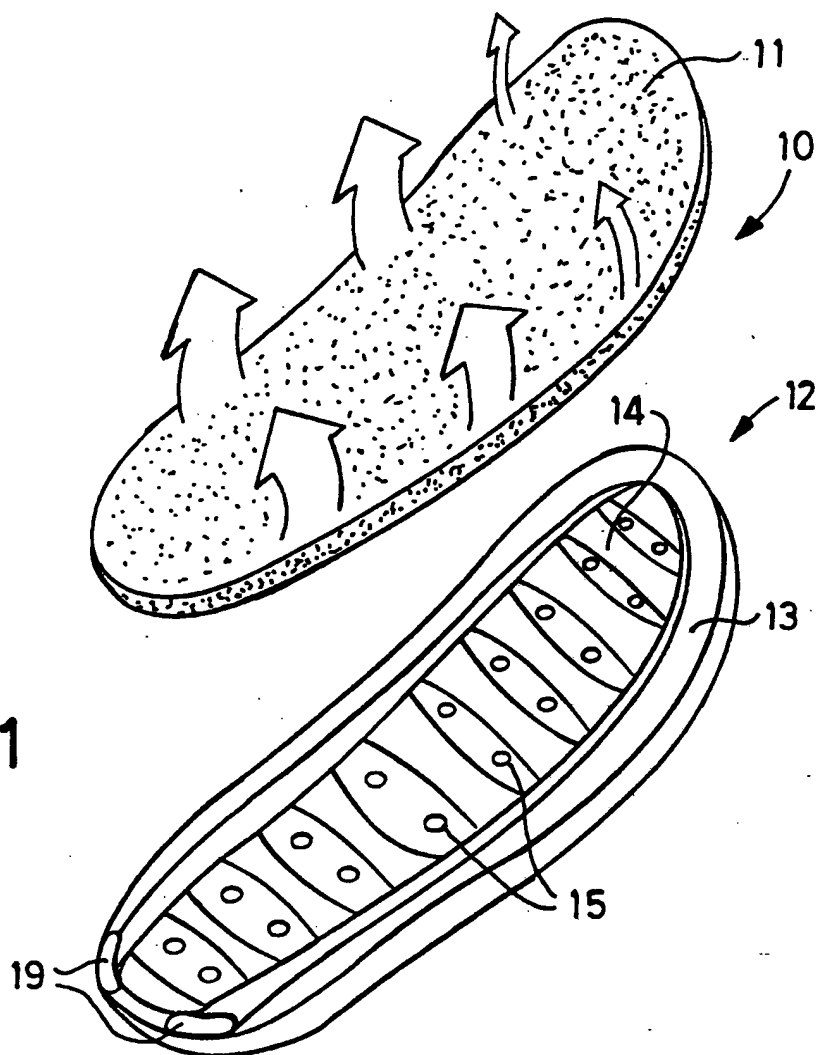
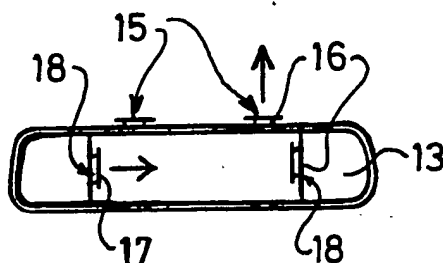


FIG. 2



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2 / 6

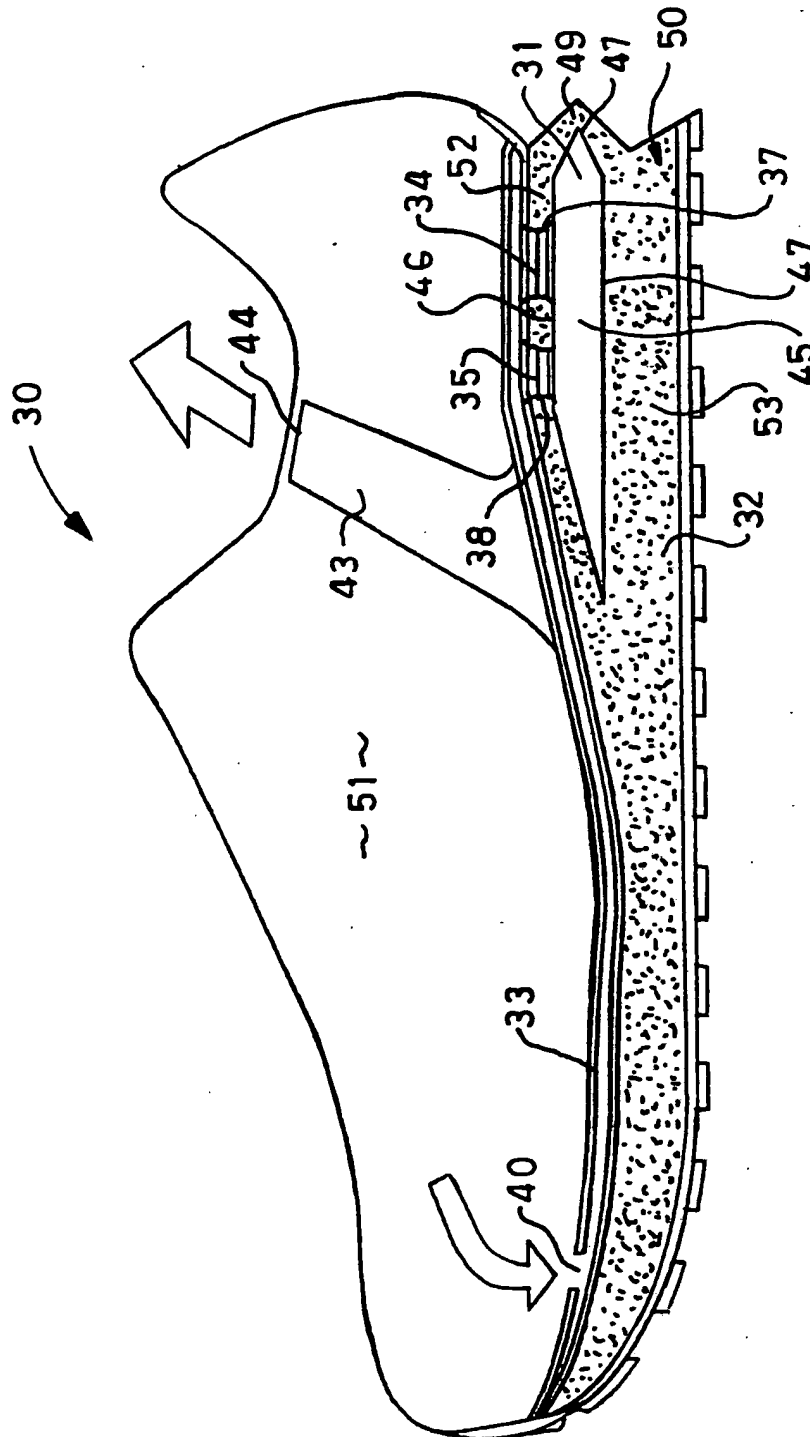


FIG. 4

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3 / 6

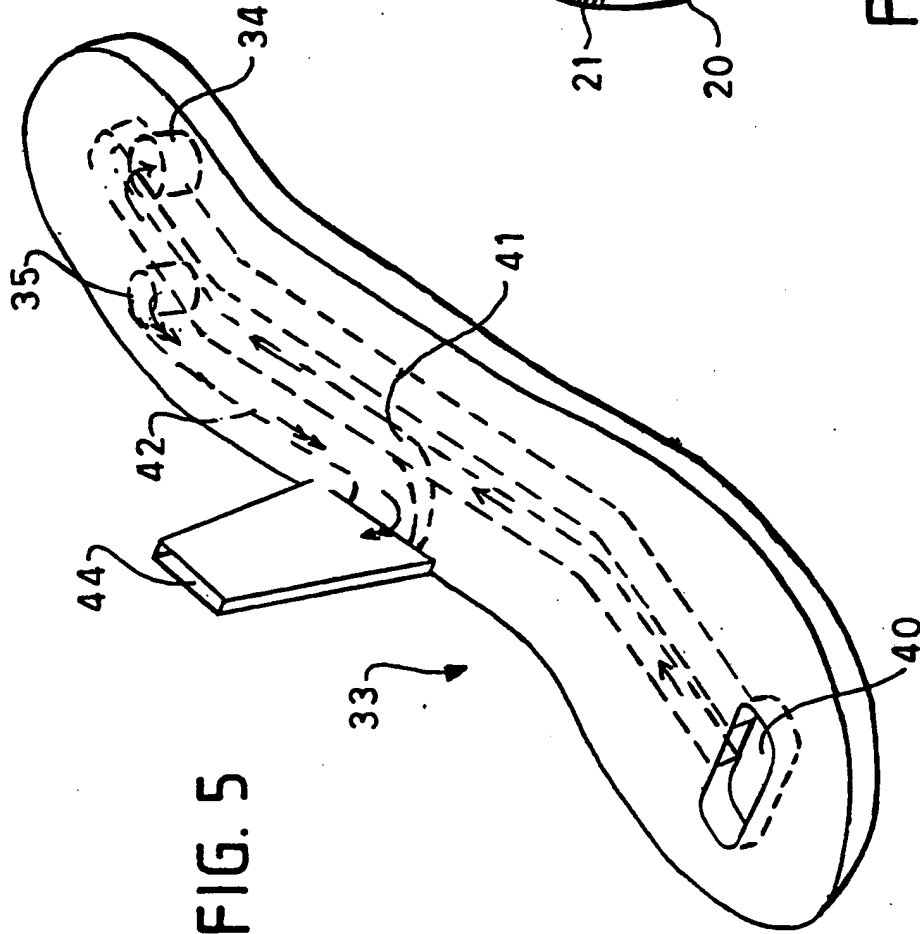


FIG. 5

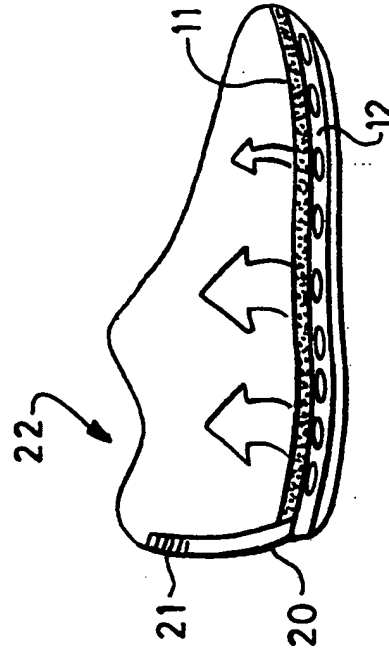


FIG. 3

4 / 6

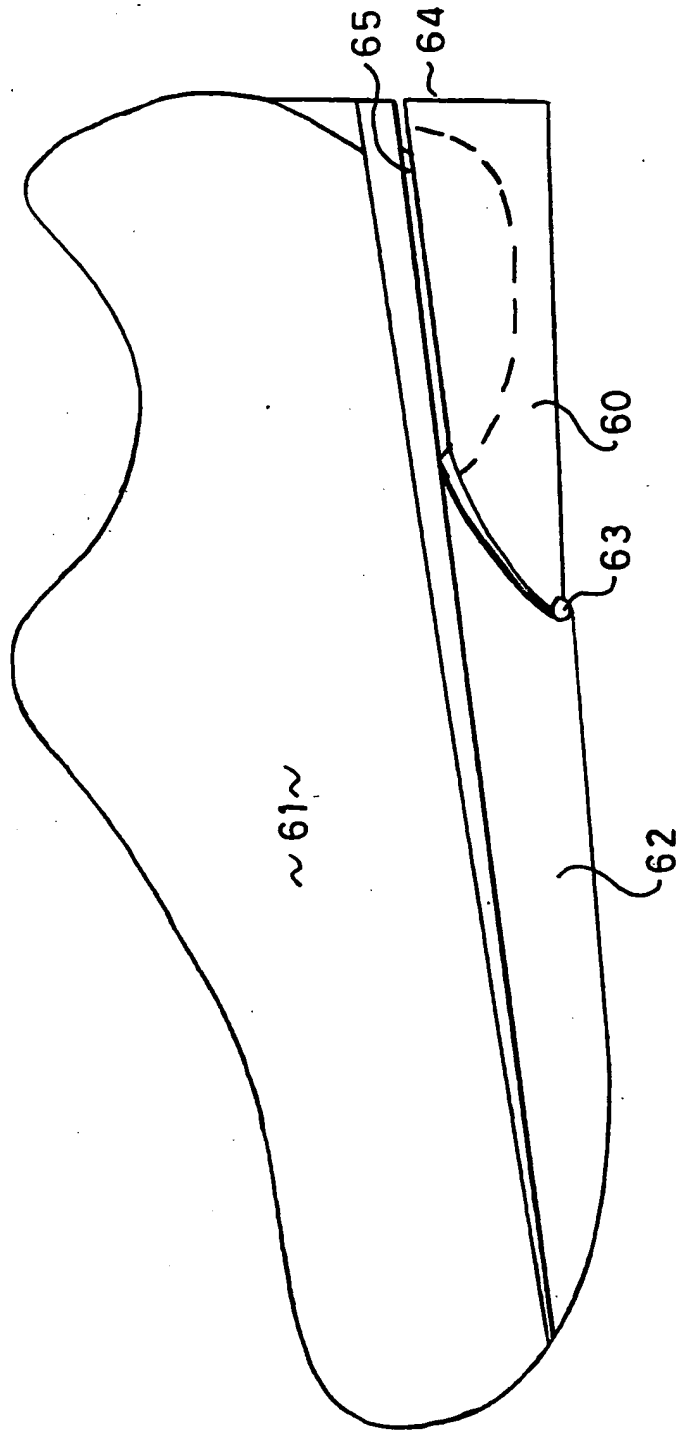


FIG. 6

5 / 6

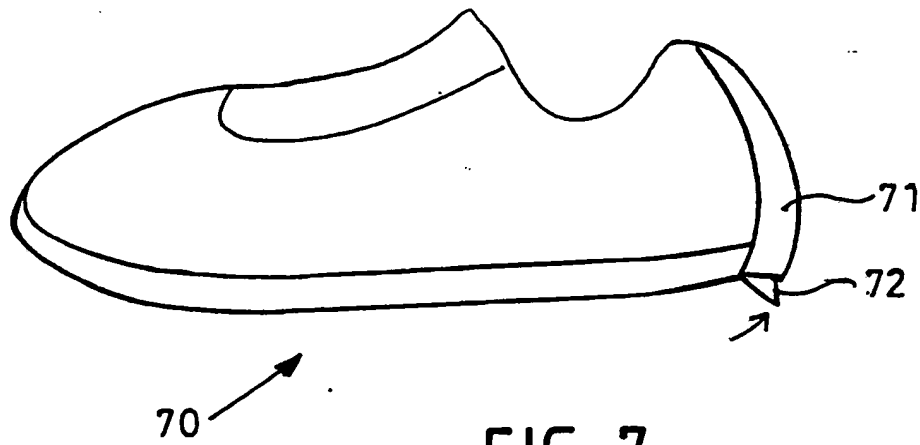


FIG. 7

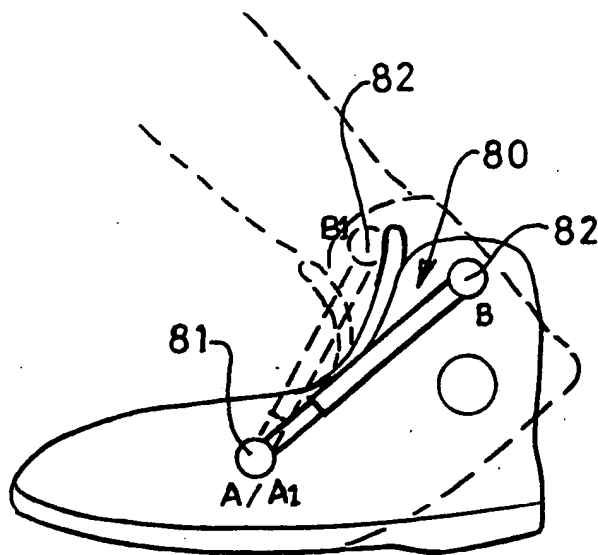


FIG. 8

6 / 6

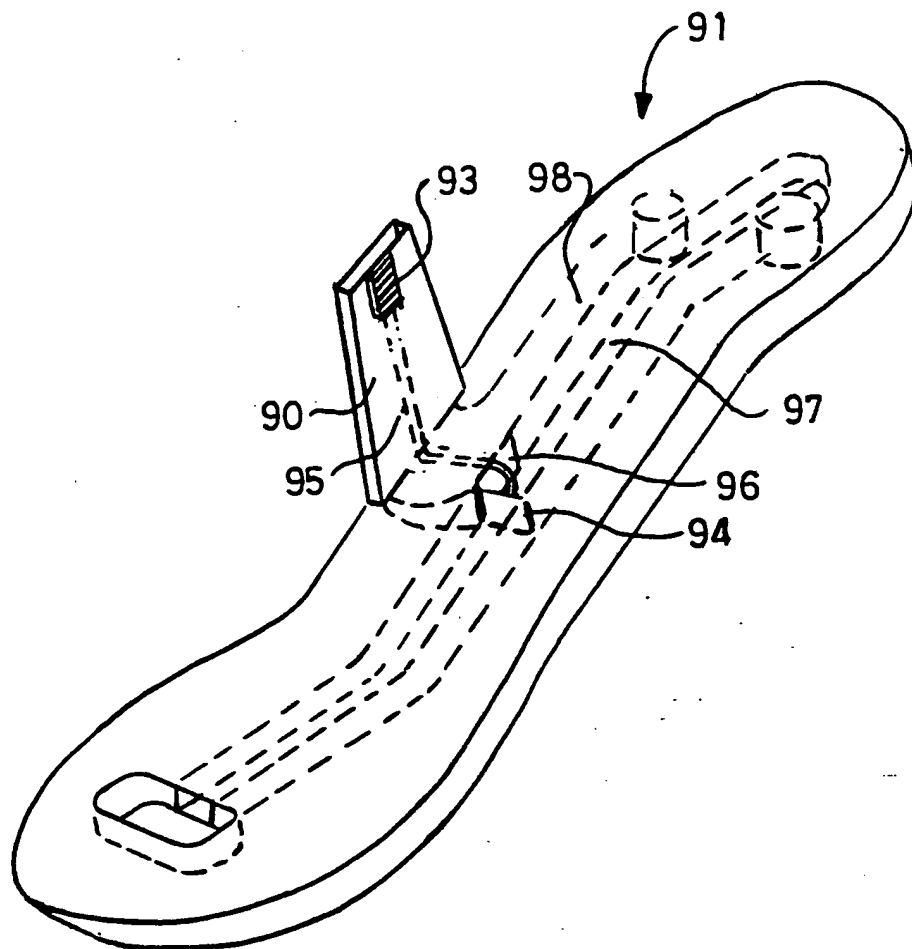


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU92/00554

A. CLASSIFICATION OF SUBJECT MATTER Int. Cl. ⁵ A43B 07/06, 07/32, 07/02, 13/20 According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC : A43B 07/06, 13/20 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU : IPC as above Electronic data base consulted during the international search (name of data base, and where practicable, search terms used)				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.		
X	GB,A, 2165439 (CALDWELL) 16 April 1986 (16.04.86) Page 1 line 109 to Page 2 line 104, Claims 1 and 8	1-4,6-14,16		
X	EP,A, 350103 (LEE) 10 January 1990 (10.01.90) Page 1 line 9 to Page 2 line 47, Claims 1-6, Figure 2	1-4,6-14,16		
P,X	GB,A, 2245145 (CHU) 2 January 1992 (02.01.92) Page 2 line 23 to Page 3 line 13, Figures 5(a) and 5(b)	1-4,6-14,16		
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. </div> <div style="width: 45%;"> <input checked="" type="checkbox"/> See patent family annex. </div> </div>				
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>* Special categories of cited documents :</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 50%; vertical-align: top;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p> </td> </tr> </table>			<p>* Special categories of cited documents :</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p>
<p>* Special categories of cited documents :</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p>			
Date of the actual completion of the international search 6 January 1993 (06.01.93)		Date of mailing of the international search report 13 JAN 1993 (13.01.93)		
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No. 06 2853929		Authorized officer RON WEBER Telephone No. (06) 2832123		

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
P,X Y	US,A, 5068981 (JUNG) 3 December 1991 (03.12.91) Column 2 line 47 to Column 4 line 2, Claim 1, Figures 1-3	1,2,6-11,13 5
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This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report			Patent Family Member				
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